

BOSTON PUBLIC LIBRARY



3 9999 06317 113 4

ANNUAL REPORT  
OF THE  
COCHITUATE WATER BOARD  
FOR  
1866-7

★6357

20

PRESENTED TO THE

6357

1866-7



By City of Boston

Received Nov. 15, 1867 No. 82510









*City Document.*— No. 88.

---

# CITY OF BOSTON.

---



---

REPORT  
OF THE  
COCHITUATE WATER BOARD  
TO THE  
CITY COUNCIL OF BOSTON,

FOR THE YEAR 1866-67.

---

City of Boston.  
Nov. 15. 1867.



CITY OF BOSTON.

---

*In Board of Aldermen, April 29, 1867.*

ORDERED: That the Cochituate Water Board be authorized to submit their Annual Report in print.

Sent down for concurrence.

CHAS. W. SLACK, *Chairman.*

*In Common Council, May 2, 1867.*

Concurred.

WESTON LEWIS, *President.*

Approved May 3, 1867.

OTIS NORCROSS, *Mayor.*



# REPORT.

---

OFFICE OF THE COCHITUATE WATER BOARD,  
*Boston, May 21, 1867.*

TO THE CITY COUNCIL.

The Cochituate Water Board respectfully present this their report for the year ending April 30th, 1867. The ordinance which passed the City Council in December 1865, authorizing the Water Board to change their financial year to correspond with that of other departments of the City Government, has fully answered the anticipations originally formed by the Board, in remedying former apparent discrepancies between their accounts, and those of the Treasurer and Auditor.

The tables submitted by the City Engineer, giving quantities consumed, levels of the lake and reservoirs, rain fall, etc., are made up for the calendar year as heretofore.

The Income for the year 1866, as appears by the report of the Water Registrar, was \$487,576.25, being \$36,196.77, in excess of that of the previous year. -

During the four months from January 1, 1867 to

May 1, 1867, there was received in advance,	
for water to be delivered during the year	\$362,674 12
And for water used in previous years	43,205 62
Total water rates received in the four months	\$405,879 74
And to this the Registrar estimates will be added	
from new customers and meter bills	94,120 26
Anticipated income for the year 1867.	\$500,000 00

The expenditure for the year ending May 1, 1867, was:—	
For current expenses . . . . .	\$122,207 37
Interest and premium on the water debt . . . . .	483,451 82
	<hr/>
Whole amount paid out . . . . .	\$605,659 19
The Treasurer has credited the Water Works for the same year, out of the amounts received as above . . . . .	
	\$530,526 80
The balance of the receipts having been credited to the Water Works, in his accounts of the pre- vious year, shows an expenditure over and above our income, for the financial year of 1866-7, of . . . . .	
	75,132 39
Which, with . . . . .	267,601 60
expended on the Chestnut Hill Reservoir, in the same year, adds to the cost of the works . . . . .	<hr/>
	\$342,733 99
Cost of the Water Works to May 1, 1866, includ- ing interest and premium on debt, less received for water rates, rents, etc. . . . .	
	6,771,975 15
	<hr/>
Making the net cost, May 1, 1867 . . . . .	\$7,114,709 14

The improvement made by the amendment to the water ordinance in December 1865, suggests the propriety of still further alterations. The annual accounts of this department are now made up for the financial year,—as are those of the Treasurer and Auditor,—but our bills, excepting only to those who draw through meters, are made for the calendar year, thus complicating our statements and reports. If the ordinance be further changed, so as to permit the bills to be made for the four months commencing January 1, and ending April 30, and thereafter be made for the year commencing on the first day of May in each year, this inconvenience will be avoided.

It was intended to complete the raising of the Tremont Street

mains last summer, those requiring it lying between Newton and Lenox streets, but the time and attention of the Board and its officers being constantly needed elsewhere, and especially at the new reservoir, it was delayed until this season. Arrangements have lately been made to proceed with the work forthwith, and it is expected that the last section will be raised and the street put in good condition for travel by the first of October next.

The improvement by the city of Tremont Street and Chandler Street at and near the bridge over the Worcester Railroad, made it necessary to erect a new bridge outside of the travelled bridge, for the purpose of carrying the two mains over the railroad; and at the request of the Committee on Streets, it was erected and the pipes removed from the old to the new bridge, under the direction of this Board, and the expense thereof charged to the account of Widening Streets, etc. The bridge was built of iron, and is in no way connected with the bridge for travel; thus avoiding any jar there would otherwise be. Thus far it has given entire satisfaction. It may be found expedient to cover it with an iron roof, to protect the pipes from the rays of the sun.

To avoid any large and unnecessary expenditure upon the East Boston reservoir, frequent examinations and discussions have been had as to the cause of the leaks and the best way of remedying them; and last fall experiments were commenced and have been continued until this time, with a view to discover if possible the weak points. We find that it will hold water to the height of ten feet, but leaks if carried above that. This reservoir was built by contract in 1850, and has always leaked when filled; and we not yet having discovered through our experiments, as was hoped we might, any particular point in the puddle bank defective; and with the further uncertainty before us as to whether or not the banks yield to a greater pressure than a head of ten feet, — it has been concluded to continue the inves-

tigations and find the cause of the leak if possible before deciding upon the remedy.

The system of inspection instituted in the fall of 1864, with a view to check wastes, has more than answered the expectations of the Board, and will be continued in operation. As soon as it was fully understood by consumers, the inspectors were cheerfully admitted by all those whose fixtures were in good condition, and others who intended to have theirs so; but they were not always welcomed by the few who are generally improvident, and do not look beyond their own immediate wants.

The often-repeated statement made in former reports of waste through hopper closets, it is necessary here again to reiterate. There exists to a considerable extent the mistaken idea that a continuous dribbling stream running through them purifies and keeps them clean, whereas a dash of one or two quarts of water is more effectual than such a stream running for hours. That this wasteful fixture may be improved in construction, as it easily can be, it is intended to apply to the City Council more formally than we now do to authorize the Board to fix such prices for different kinds of water closets as they may from time to time deem equitable and expedient.

As appears by the table of the levels of the Lake, the supply for 1866 was nearly equal to the average supply for the previous five years; and by the table of the daily average draft from the Brookline Reservoir in 1866, the consumption, including waste, averages 12,229,000 wine gallons daily, being an average of 3,845,160 gallons less each day than the average draft for the previous five years.

To the ready acquiescence by the consumers generally, in the course taken by the Board, and their observance of the appeals made to them in the fall of 1864,—to stop wastes and all unnecessary drafts of water,—may fairly be attributed the fact, that they had a constant supply during the two last months of that year and the two first of the year following. It may appear

upon the first glance at the tables giving the levels of the Lake, that there was no probability of the supply failing, there being in December 1864, five and  $\frac{4}{10}$  feet of water above the bottom of the Conduit; the lowest point reached since the works were constructed, but it must be borne in mind, that the quantity contained in a foot in depth at that point is not equal to one half of that in a foot in depth at the surface when the Lake is full, and as it is further drawn down, so in a compound ratio is the decrease of water. Beside if drawn down much below five feet above the bottom of the Conduit, the quantity daily required, supposing it to be no more than in 1866, cannot be supplied, as the average depth run in that year was nearly four feet and eleven inches. Had the Lake so fallen off that only three feet could have been run, it would have been necessary to restrict the use of the water for a time, to domestic purposes only; and consequently a large proportion of our factories and workshops would have been stopped in their operations, causing no little pecuniary distress among the industrial classes, and thereby materially affecting the growth and prosperity of the city.

Since the death of Mr. Knowlton, Superintendent of the Western Division, in March 1866, the especial charge thereof has been intrusted to the Chairman of the Committee on that division,—assisted by Mr. A. Stanwood, our Superintendent at Chestnut Hill Reservoir, who has lately been chosen Superintendent of the Western Division.

In the year 1865 the Lake was full—that is thirteen feet and four inches above the bottom of the conduit at the Lake—and the water continued to run over the dam and waste into the Sudbury river from March 31st to June 1st. The highest level in 1866 was in June, when it reached to a level of twelve feet ten inches, being six inches short of high water mark,—and of course no water ran to waste during that year. In this year, 1867, the heavy rain on the 9th and 10th of February, with the melting snow, raised the Lake from twelve feet four inches to high

water at noon of the latter day, and at six o'clock in the afternoon it stood at thirteen feet five inches, and one inch in depth was running to waste over the dam. The highest level reached was on the 12th of February, it then being fourteen feet one inch, and remaining at that level for a few days it gradually fell about half an inch daily until the 23d, and from that time until the middle of April, it varied from thirteen feet four inches to thirteen feet nine inches.

On those occasions when the water attains a level above high water mark, and there are prospects of freshets from rains and melting snow, the precaution is taken to remove some of the stop-planks at the dam, to permit a greater flow of water than can otherwise pass over the dam, above high water mark, for the purpose of avoiding any unnecessary wash of the banks of the Lake, and overflow of the roads in the vicinity.

In the afternoon of the 27th day of July, there was at the Lake and in the immediate vicinity a very heavy shower, when in a few hours, there fell the unprecedented quantity of seven and  $\frac{6}{10}$  inches of rain, washing the roads badly, carrying away a portion of the road against the Course Brook culvert and damaging the filter dam on Pegan Brook. The level of the Lake was carried up in twenty-four hours, eight inches. Since then we have been so blessed with an abundance of water, that the culvert and filter dam could not be improved to advantage; but as soon as the water is sufficiently low to permit of the work being done well, they are to be taken in hand.

From experience already had of the good service of the filter dam on the Pegan Brook, it is evident that by repairing and improving it, and erecting another dam parallel with it, the impurities on this brook may be effectually stopped from flowing into the lake.

The dwelling house and gate house at the Lake are to be painted the coming season, and the fences propped up so as to answer a little while longer. The cobble-stone slope walls, for



protecting the banks of the Lake, have only partially answered the purpose, they being too light; good and suitable stones are scarce in the immediate neighborhood, but we have some ledges on the lands of the City, which it may be expedient to work, for the purpose of making substantial slope walls to those banks most exposed to wash when high winds prevail.

Negotiations have been had with the Rev. Mr. Walsh, for a portion of the Catholic burying ground, in Natick, bordering on Dug Pond, which it is desirable for the City to own, for the better protection of the pond against any wash that otherwise might affect the water. The disposition to accommodate the City is so evident, that we are confident of arranging this matter to our entire satisfaction.

The Brookline Reservoir requires a thorough cleansing, and at the first practicable moment must be attended to, as also the gate house, which leaks badly when the water is more than six feet and four inches above the bottom of the conduit; until one of the basins of the Chestnut Hill Reservoir is completed, it is utterly impossible to do this properly, and at the same time keep the City supplied with water. The grounds around this reservoir require enriching, and this autumn there will be spread over it a large quantity of the muck and manure obtained from the new reservoir.

The construction of the Chestnut Hill Reservoir has progressed as rapidly as we could have reasonably expected, yet it is not so near to completion as we had hoped it would be at this time. There has been quite as much to do, — and some of it has been better done, — than was at first contemplated. As large a force has been constantly employed as could work to advantage, and this force will be increased from time to time, to an extent that will be limited only by judicious economy. It has been our policy to pay our *employés* fair wages for their services, and have them well treated; and with but few exceptions they have rendered a fair equivalent. On the second of March of this year the

laborers, two hundred and twenty-five in number, without any previous intimation of their intentions or of a desire for any change, virtually proposed to supersede those in authority, and fix their own wages to suit themselves. They were then receiving one dollar and fifty cents per day. Not feeling disposed to thus resign the duties intrusted to us, directions were given to pay off and discharge them all, and not employ any of them again. We have since been informed that a few restless, rambling men were the leaders in the affair, and misled the better men, who were largely in the majority, and became the real sufferers, as many of them resided near the works with their families. In three days we had as many men employed as before. Their wages were raised on the fourth day of May to one dollar and seventy-five cents per day.

On the fifth day of June sixteen masons employed on the large sewer which is to receive the drainage of the roads, declined to work, unless certain good men, who had been for sometime employed on the ledges, were stopped from laying bricks in the puddle trench, which happened to be only a temporary arrangement, to last only until such time as we had ledgework for them.

Having no doubt as to the impropriety of such dictation, the masons were paid off, and discharged forthwith, since which time we have had as many good and faithful masons in our employ as we have needed.

In the beginning of March as many of the Board as could leave home, accompanied by Mr. Crafts, City Engineer, and Mr. Wightman, Resident Engineer at Chestnut Hill Reservoir, visited New York, Brooklyn, Philadelphia, Baltimore and Washington, for a partial examination of the water works of those cities. The councils of Philadelphia and Baltimore entertained us in the most hospitable manner, and the officials of all the places we visited proffered every facility for the accomplishment of our purpose in the shortest possible time, and by

them all we were treated with the greatest courtesy. This tour of inspection, although necessarily hurried, was very instructive, and the information obtained by the board and engineers will prove of great advantage to the City, especially in constructing the new reservoir.

Whenever any populated territory, unsupplied with water is annexed to the City of Boston, it will be necessary to look for a further supply than we now have, as it is very clear that our present resources will be needed for our present territory when peopled, unless the city of Charlestown should first be annexed. It is well understood that that city has water far exceeding her anticipated wants, but we have not been able to obtain a specific estimate of the extent of the supply though we have been given to understand that its able engineer, Mr. Baldwin, has instituted measures for gauging it accurately.

For further information and details, we present herewith the several reports of the City Engineer, Superintendent of the Eastern Division, Water Registrar and Clerk of this board.

Respectfully submitted.

JOHN H. THORNDIKE.

L. MILES STANDISH.

NATHANIEL J. BRADLEE.

ALEXANDER WADSWORTH.

CHARLES R. McLEAN.

BENJ'N F. STEVENS.

WILLIAM S. HILLS.

OFFICE OF THE COCHITUATE WATER BOARD,  
BOSTON, MAY 5, 1867.

---

*To the President of the Cochituate Water Board:—*

SIR, —

The following is a statement of the Expenditures and Receipts of this department for the year commencing May 1, 1866, and ending April 30, 1867.

EXPENDITURES.

Blacksmith shop, for stock, etc.	281 90
Plumbing shop,       "       "	55 50
Raising water pipes on Tremont Street in 1865 .	626 13
Land and water rights . . . . .	120 00
Stable . . . . .	603 11
Hose . . . . .	564 00
Damage . . . . .	185 00
Repairing boxes at bridges . . . . .	741 56
Taxes . . . . .	235 12
Tools . . . . .	438 53
Travelling expenses . . . . .	25 00
Fountains . . . . .	466 15
Office expense . . . . .	20 00
Laying main pipes, etc., for stock, etc. . . . .	699 25
Postage and expresses . . . . .	45 33
<i>Amount carried forward,</i> . . . . .	\$5,106 58

## REPORT OF THE WATER BOARD.

15

<i>Amount brought forward,</i>	\$5,106 58
Reservoirs — Beacon Hill	1,022 98
“ East Boston	1,531 87
“ South Boston	323 43
“ Brookline	1,299 98
Aqueduct repairs	721 82
Printing, (including water registrar's and superintendent's)	653 12
Stationery, (including water registrar's and superintendent's)	489 18
Salaries, (including clerks and inspectors in water registrar's department)	10,436 92
Main pipe	18,540 25
Service pipe	8,832 04
Off and on water	4,688 78
Extra inspectors	6,176 53
Wages — laying main pipe	3,861 70
“ “ service pipe, etc.	4,451 13
“ blacksmith shop	1,268 41
“ plumbing shop	185 38
“ proving yard	4,395 58
Upper yard, finishing buildings, etc.	2,168 92
Miscellaneous expenses	514 22
Meters	16,399 60
Maintaining meters	1,437 30
Repairing main pipe	4,054 84
“ service pipe	4,067 12
“ hydrants	2,442 72
“ streets	2,107 94
“ stopcocks	436 11
Stopcocks	1,840 76
Hydrants	3,280 60
<i>Amount carried forward,</i>	<hr/> \$112,735 81

<i>Amount brought forward,</i>	.	.	.	.	\$112,735	81
Lake	.	.	.	.	3,040	72
Proving yard, stock, etc.	.	.	.	.	1,599	52
Hydrant and stopcock boxes	.	.	.	.	3,123	70
Tolls and Ferriage	.	.	.	.	107	62
Chestnut Hill Reservoir	.	.	.	.	267,601	60
						<hr/>
Amount drawn for the Water Works	.	.	.	.	388,208	97
" " " " driveway around Chestnut						
Hill Reservoir	.	.	.	.	13,694	41
						<hr/>
Total drawn for by the Board	.	.	.	.	\$401,903	38

And which is charged as follows:

To Chestnut Hill Reservoir	.	.	.	.	267,601	60
Water Works	.	.	.	.	120,607	37
Driveway	.	.	.	.	13,694	41
						<hr/>
Total from April 30, 1866, to May 1, 1867					401,903	38
						<hr/>

Total amount charged Water Works . . . 388,208 97

#### RECEIPTS.

##### *Cash Paid City Treasurer.*

Received for meters sold	.	.	\$100	00
" " fines for waste, etc.	.	.	1,309	00
" " Off and on water,				
for repairs	.	.	1,668	00
" " Pipe, laying, repair-				
ing, etc.	.	.	8,923	00
" " wood sold Chestnut				
Hill Reservoir	.	.	326	95
				<hr/>
				12,326 95
				<hr/>
				\$375,882 02
				<hr/>

## THE ABOVE IS CREDITED TO

Chestnut Hill Reservoir . . . . .	\$326 95
Water Works . . . . .	12,000 00
	<hr/>
	12,326 95
	<hr/>

Total amount drawn for . . . . . \$401,903 38

## EXTENSION OF THE WORKS.

Main pipe . . . . .	\$18,540 25
Wages laying main pipe . . . . .	3,861 70
Laying main pipe, stock, etc. . . . .	699 25
Upper yard, finishing shed, etc. . . . .	1,018 92
	<hr/>
	24,120 12
	<hr/>
	\$377,783 26

Less amount charged C. H. Reser- voir . . . . .	267,601 60
“ “ “ Driveway . . . . .	13,694 41
	<hr/>
	281,296 01
	<hr/>

Amount of expenses from April 30, 1866, to  
May 1, 1867 . . . . . \$96,487 25

*Expenditures and Receipts on Account of the Water Works, to  
May 1, 1866.*

Amount drawn by Commissioners . . . . .	\$4,043,718 21
“ “ Water Board, in 1850 . . . . .	366,163 89
“ “ Cochituate Water Board, from January 1, 1851, to May 1, 1866 . . . . .	1,864,231 23
Amount drawn from April 30, 1866, to May 1, 1867, for Water Works . . . . .	388,208 97
	<hr/>
	\$6,662,322 30

Amount paid the City Treasurer by the Commissioners . . . . .	\$47,648 38
	<hr/>
Amounts carried orward, . . . . .	\$47,648 38 \$6,662,322 30

<i>Amount brought forward,</i>	\$47,648 38	\$6,662,322 30
Amount paid by Water Board, 1850,	8,153 52	
“ “ Cochituate Water		
Board, to May 1, 1866 . . .	149,112 08	
Amount paid from April 30, 1866,		
to May 1, 1867 . . .	12,326 95	
	<hr/>	217,240 93

Net amount drawn from the Treasurer, by the  
Commissioners and Water Boards, for the  
Water Works . . . . . 6,445,081 37

Gross payments (including interest, premium, etc.), for ac't of the Water Works . . .	13,026,195 73
Gross receipts . . . . .	5,911,486 59
	<hr/>
Net cost to the City, May 1, 1867 . . .	7,114,709 14
	<hr/> <hr/>

SAM'L N. DYER,  
*Clerk Cochituate Water Board.*



REPORT OF THE SUPERINTENDENT OF THE EASTERN  
DIVISION.

---

BOSTON, May 7, 1867.

JOHN H. THORNDIKE, Esq.,

*President of the Cochituate Water Board:*

SIR:—I herewith submit my Report for the year ending May 1, 1867.

Below, in the usual form, you will find the amount and location of main pipes, service pipes, etc., laid during the year. In addition to this, considerable labor has been performed in repairs that come under no particular heading. The following is a portion of it:

The coating of the bottom of the East Boston Reservoir, composed of paying stones and cement, has been removed preparatory to repairs necessary to stop the leakage.

This was done in September last. Water to the depth of two feet was then let in, and allowed to remain a sufficient time to ascertain, if possible, the point of leakage; this was continued, but showed no leak until it reached the height of ten and one half feet. At this point it showed at the different places as before.

This would naturally indicate the weak place, but whether the reservoir below this point would stand the pressure of an increase of fifteen feet in height or not, I leave the City Engineer to decide.

The fender on Warren Bridge has been repaired twice during the year. That portion on the Boston side of the draw is very rotten, and should be made new.

A portion of the support for the 20-inch pipes under the bridge broke away last October, leaving the pipes in a dangerous condition. It was repaired.

The box over the pipes by the side of Chelsea Bridge was repaired last fall, and one coat of paint put on and another will be added this spring.

The work of changing the location of the large mains at the railroad bridge on Tremont Street was completed during the winter.

This work, as you are aware, was performed under many difficulties. The many kinds of work going on at the same time, the nature of the foundation, and the extreme cold weather (including the great snow storm), made it arduous, uncomfortable and perplexing. On the south side the foundation for the support of the pipes was made as good as circumstances and my knowledge would admit, but I shall be surprised if some leaks do not occur.

Up to the present time, however, with the exception of the sweating of two or three joints, there has been but one leak. On the north side, there is, and has been, no signs of a leak.

The wood and iron work at the Beacon Hill Reservoir has been thoroughly painted, and is much improved in appearance.

The South Boston Reservoir showed a small leakage during the year, only enough however to prevent the laying of a portion of the sidewalk on the south side. A blind drain remedied the difficulty. At the upper yard, work of building, grading, etc., has been carried on at such intervals as there was help to spare, and I hope before long to have it in an acceptable condition.

I would also mention that this department has, since April 1, 1866, done the practical part of establishing three hundred and thirty-one meters.

Raised 150 feet 6-inch Pipe on Albany Street.

Taken up 137 feet 6-inch Pipe on Lehigh Street.

Taken up 1532 feet 6-inch Pipe on Belmont Street and Washington Square.

Taken up 155 feet 4-inch Pipe on Western Avenue.

"	215	"	2-inch	"
"	503	"	1½-inch	"
"	95	"	1¼-inch	Lead Pipe.
"	232	"	1-inch	"
"	329	"	¾-inch	"
"	2173	"	⅝-inch	"
"	15	"	½-inch	"

Lowered 350 feet 12-inch Pipe on Boylston Street, west of Berkeley Street.

Extended 1-inch Pipe 10 feet.

"	¾-inch	"	44	"
"	⅝-inch	"	85	"

*Statement of Location, Size and Number of Feet of Pipe laid in 1866.*

In what Street.	Between what Streets.	Diameter of Pipe in Inches.	Feet of Pipe.
BOSTON PROPER.			
Mt. Vernon . . . .	Below River . . . . .	12	285
Berkeley . . . . .	Cortes and Stanhope . . . . .	12	340
	Total 12 inches in Boston . . . . .		625
Marlboro' . . . .	Berkeley and Clarendon . . . . .	8	182
" . . . .	Across Clarendon . . . . .	8	24
Newton . . . . .	Harrison Avenue and Albany . . . . .	8	750
	Total 8 inches in Boston . . . . .		906
Wareham . . . .	Harrison Avenue and Albany . . . . .	6	350
West Chester Park	West of Tremont . . . . .	6	106
River . . . . .	North of Mt. Vernon . . . . .	6	132
Dartmouth . . . .	Montgomery and Warren Avenue . . . .	6	200
Albany . . . . .	Oak and Curve . . . . .	6	43
Newbury . . . .	Arlington and Berkeley . . . . .	6	80
Springfield . . . .	West of Tremont . . . . .	6	97
Marlboro' . . . .	Across Clarendon . . . . .	6	87
West Newton . . .	West of Tremont . . . . .	6	150
Cortes . . . . .	From Ferdinand to Berkeley . . . . .	6	600
East Brookline . .	Albany and Harrison Avenue . . . . .	6	273
Stanhope . . . .	Berkeley and Clarendon . . . . .	6	532
West Pembroke . .	West of Tremont . . . . .	6	212
Warren Ave . . .	South of Pembroke . . . . .	6	215
" " . . . .	Canton and " . . . . .	6	533
West Canton . . .	West of Tremont . . . . .	6	63
Rutland Sq. . . .	" " (south side) . . . . .	6	64
West Brookline . .	" " . . . . .	6	92
Pinckney . . . .	Below Charles . . . . .	6	286
North Charles . .	Cambridge and Poplar . . . . .	6	308
Brimmer . . . .	Pinckney and Mt. Vernon . . . . .	6	288
	Total 6 inches in Boston . . . . .		4,711

*Statement of Location, Size, etc. — Continued.*

In what Street.	Between what Streets.	Diameter of Pipe in Inches.	Feet of Pipe.
River . . . . .	Pinckney and Mt. Vernon . . . . .	4	113
Lagrange . . . . .	Washington and Tremont . . . . .	4	141
Temple Place . . . . .	“ “ “ . . . . .	4	147
Meander . . . . .	Norwich and Dedham . . . . .	4	210
Park . . . . .	Court in rear of No. 8 . . . . .	4	114
Chapman . . . . .	West of Tremont . . . . .	4	241
Battery Wharf . . . . .		4	225
Park Square . . . . .	Boylston and Eliot . . . . .	4	250
Central Wharf . . . . .		4	23
Total 4 inches in Boston . . . . .			1,464
SOUTH BOSTON.			
First . . . . .	E and D . . . . .	6	105
Alger . . . . .	Federal and Dorchester . . . . .	6	34
I St. . . . .	Fourth and Broadway . . . . .	6	214
Sixth . . . . .	H and O . . . . .	6	323
Ninth . . . . .	I and K . . . . .	6	517
Middle . . . . .	Dorchester and Federal . . . . .	6	50
Foundry . . . . .	Swan and O. C. & N. R. R. . . . .	6	396
Total 6 inches in South Boston . . . . .			1,639
Alger . . . . .	Federal and Dorchester . . . . .	4	23
Quincy . . . . .	C and D . . . . .	4	118
Dove . . . . .	F and Dorchester . . . . .	4	36
Total 4 inches in South Boston . . . . .			177
EAST BOSTON.			
Chelsea . . . . .	North of Glendon . . . . .	6	309
Total 6 inches in East Boston . . . . .			309
Paris Court . . . . .	Paris and Chelsea . . . . .	4	180
Chelsea St. . . . .	For Farrar's Oil Works . . . . .	4	156
Total 4 inches in East Boston . . . . .			336

*Statement of Location, Size, etc. — Continued.*

In what Street.	Between what Streets.	Diameter of Pipe in Inches.	Feet of Pipe.
	ROXBURY.		
Texas Avenue . .		12	45
	Total 12 inches in Roxbury . . . . .		45
Tremont . . . . .	Opposite Culvert . . . . .	6	387
	Total 6 inches in Roxbury . . . . .		387
Tremont . . . . .	Opposite Culvert . . . . .	4	100
	Total 4 inches in Roxbury . . . . .		100

## RECAPITULATION.

SECTION.	1866.	DIAMETER IN INCHES.				
		36.	12.	8.	6.	4.
Boston Proper . . .	Total number of feet laid . . .	..	625	906	4,711	1,464
	Stopcocks in same . . . . .	..	2	3	11	6
South Boston . . . .	Total number of feet laid . . .	..	..	..	1,639	177
	Stopcocks in same . . . . .	..	..	..	3	..
East Boston . . . . .	Total number of Feet laid . . .	..	..	..	309	336
	Stopcocks in same . . . . .	..	..	..	1	..
Roxbury . . . . .	Total number of Feet laid . . .	..	45	..	387	100
	Stopcocks in same . . . . .	..	1	..	..	..
	Sums of Pipes . . . . .	..	670	906	7,046	2,077
	Sums of Stop-cocks . . .	..	3	3	15	6

*Statement of the Length of different Sizes of Pipes laid, and Number of Stopcocks put in, to May 1, 1867.*

	DIAMETER OF PIPES IN INCHES.										AGGREGATE.
	40.	36.	30.	24.	20.	16.	12.	8.	6.	4.	
Feet of Pipe laid in Brookline, Roxbury and Boston Proper	23,082	19,991	29,696	5,773	.. .	6,096	60,671	2,020	246,524	82,157	
Number of Stopcocks in same . . . . .	4	6	8	10	1	19	119	5	506	282	
Feet of Pipe laid in South Boston . . . . .	.. .	.. .	.. .	.. .	8,155	.. .	18,938	2,871	93,017	26,461	
Number of Stopcocks in same . . . . .	.. .	.. .	.. .	.. .	4	.. .	31	2	131	62	
Feet of Pipe laid in East Boston . . . . .	.. .	.. .	.. .	.. .	15,972	1,523	16,150	.. .	69,802	4,754	
Number of Stopcocks in same . . . . .	.. .	.. .	.. .	.. .	6	3	23	.. .	92	29	
Feet of Pipe laid in Newton and Needham . . . . .	.. .	1,074	2,140	.. .	.. .	.. .	159	.. .	.. .	.. .	
Number of Stopcocks in same . . . . .	.. .	.. .	.. .	.. .	.. .	.. .	2	.. .	1	.. .	
TOTALS . . Length of Pipe laid . . . . .	23,082	21,065	31,836	5,773	24,127	7,619	95,918	4,891	409,343	113,372	737,026 feet, equal to 139 mils. 3,106 ft.
Number of Stopcocks put in . . . . .	4	6	8	10	11	22	175	7	730	373	1,346

*Statement of Service Pipe laid in 1866.*

Diam. in inches.	BOSTON PROPER.		SOUTH BOSTON.		EAST BOSTON.		TOTAL.	
	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.	Number of Pipes.	Length in Feet.
2	1	41	...	...	...	...	1	41
1	7	275	2	45	1	18	10	338
$\frac{3}{4}$	2	84	3	177	...	...	5	261
$\frac{5}{8}$	268	9,743	75	2,556	45	1,644	388	13,943
$\frac{1}{2}$	63	1,772	55	2,626	48	1,597	166	5,995
AGGREGATE . . . . .							570	20,578
Making the total number up to May 1, 1867 . . . . .								26,201

*Repairs of Pipes during the Year 1866.*

WHERE.	DIAMETER OF PIPES IN INCHES.																		
	40.	36.	30.	24.	20.	16.	12.	8.	6.	4.	3.	2.	1½.	1¼.	1.	¾.	⅝.	½.	Total.
Boston . . . . .	4	2	4	.	3	.	25	.	29	45	1	6	68	.	7	8	335	7	544
South Boston . . . .	.	.	.	.	.	.	.	.	5	3	.	1	.	.	.	1	54	5	69
East Boston . . . . .	.	.	.	.	10	.	2	.	3	4	.	.	.	.	4	.	37	2	62
Totals . . . . .	4	2	4	.	13	.	27	.	37	52	1	7	68	.	11	9	426	14	675

Of the leaks that have occurred in pipes of 4 inches and upwards, 97 were on the joints, 17 by settling of earth, 4 by defective pipe, 18 by frost, 2 by defective packing, 1 broken by pile driving. Total, 139.

Of 2 and 3 inches and in Service Pipes: 9 were on the joints, 163 by settling of earth, 85 by defective pipe, 31 by defective coupling, 10 by defective faucet, 6 by defective packing, 61 by rust, 60 by frost, 23 stopped by fish, 60 stiff connection, 7 by



faucet loose at main, 1 by faucet broken at main, 7 struck by pick, 5 stopped by gasket, 1 stopped by dough, 2 stopped by dirt, 1 by nail, 1 broken by settling of wall, 1 by boxing, 1 by faucet blown out, 1 by settling of drain. Total, 536.

*Statement of Number of Leaks, 1850-1866.*

YEAR.	DIAMETER OF		TOTAL.
	Four Inches and Upwards.	Less than Four Inches.	
1850.....	32	72	104
1851.....	64	173	237
1852.....	82	241	323
1853.....	85	260	345
1854.....	74	280	354
1855.....	75	219	294
1856.....	75	232	307
1857.....	85	278	363
1858.....	77	324	401
1859.....	82	449	531
1860.....	134	458	592
1861.....	109	399	508
1862.....	117	373	490
1863.....	97	397	494
1864.....	95	394	489
1865.....	111	496	607
1866.....	139	536	675

*Hydrants.*

During the year thirty-three (33) new Hydrants have been established as follows :

Twenty (20) in Boston proper, five (5) in South Boston, five 5 in East Boston, and three (3) in Roxbury.

Total number of Hydrants established up to May 1, 1867:

In Boston proper . . . . .	1,011
South Boston . . . . .	332
East " . . . . .	196
Brookline . . . . .	3
Roxbury . . . . .	16
Charlestown . . . . .	11
Chelsea . . . . .	8
Total . . . . .	<hr/> 1,577

Thirty-three (33) Hydrants have been taken out and replaced by new or repaired ones, and one hundred and forty-nine (149) boxes have been renewed. The Hydrants have had the attention of former years paid them.

*Stopcocks.*

Twenty-seven (27) new Stopcocks have been established this year, and sixty-one (61) Boxes have been renewed. All the Stopcocks have had the usual attention paid them.

*Statement of Pipes and other Stock on hand, exclusive of Tools,  
May 1, 1867.*

NUMBER OF	DIAMETER IN INCHES.													
	40.	36.	30.	24.	20.	18.	16.	12.	8.	6.	4.	3.	2.	
Pipes . . . . .	17	17	84	5	40	3	30	43	3	223	242	2	.	
Blow-off Branches . . . . .	1	..	2	..	..	..	..	..	..	..	..	..	..	
Y. Branches . . . . .	..	..	1	..	..	..	1	1	..	5	..	..	..	
Three Way-branches . . . . .	6	4	1	..	3	..	5	11	2	28	5	1	14	
Four Way-branches . . . . .	..	..	3	1	..	..	2	3	7	1	..	..	..	
Flange Pipe . . . . .	2	2	5	2	4	..	..	4	..	7	..	..	..	
Sleeves . . . . .	5	3	3	8	3	..	3	7	3	18	18	12	33	
Clamp Sleeves . . . . .	..	3	5	2	..	..	3	3	..	5	23	2	..	
Caps . . . . .	2	2	5	1	..	..	2	19	3	22	18	..	..	
Reducers . . . . .	3	2	..	2	..	..	3	6	3	4	14	..	..	
Bevel Hubs . . . . .	..	..	..	..	..	..	..	..	..	6	3	..	..	
Curved Pipes . . . . .	..	3	14	1	6	..	3	5	..	1	1	..	..	
Quarter Turns . . . . .	..	..	..	..	1	..	..	6	2	2	2	..	7	
Double Hubs . . . . .	..	..	..	..	4	..	9	..	..	2	..	..	..	
Offset Pipes . . . . .	..	..	..	..	..	..	..	..	..	8	1	..	..	
Yoke Pipes . . . . .	..	..	..	..	..	..	..	5	..	9	..	..	..	
Man-hole Pipes . . . . .	2	..	2	..	..	..	..	..	..	..	..	..	..	
One-eighth Turns . . . . .	1	..	..	..	..	..	..	1	3	..	9	1	..	
Pieces of Pipe . . . . .	1	10	22	3	13	..	1	13	2	16	16	1	..	
Stopcocks . . . . .	1	1	1	2	2	..	2	4	1	16	14	7	..	

*Hydrants.* 32 New Lowell, 6 Wilmarth (old), 7 Lowell (old).

*For Hydrants.* 38 bends, 47 lengtheners, 21 frames, 95 covers, 30 plungers, 24 screws, 1 waste, 19 nipples, 28 valve seats, 36 stuffing boxes, 3 hose couplings, 143 lbs. composition castings, 3,800 lbs. iron castings, 5 wharf hydrants.

*For Stopcocks.* 2 36-inch screws, 1 30-inch ditto, 2 24-inch ditto, 1 20-inch ditto, 1 16-inch ditto, 11 6-inch ditto, 5 4-inch ditto, 6 4-inch unfinished ditto, 1 ditto for Waste Weir, 1 ditto for Brookline Reservoir, 3 12-inch plungers, 4 6-inch ditto, 6 4-inch ditto, 8 6-inch rings, 12 4-inch ditto, 16 frames, 6 covers.

*Meters.* In the shop, 3 2-inch meters, 51 1-inch ditto, 18  $\frac{5}{8}$ -inch ditto, 1 1-inch and 1  $\frac{5}{8}$ -inch ditto condemned.

*Stock for Meters.* 68 1-inch nipples, 8 2-inch ditto, 32  $\frac{5}{8}$ -inch ditto, 8 2-inch connection pieces, 14 1-inch ditto, 38  $\frac{5}{8}$ -inch ditto, ditto, 2 3-inch meter clocks, 3 2-inch ditto, 17 1-inch ditto, 13  $\frac{5}{8}$ -inch ditto, 15 1-inch meter cocks, 23  $\frac{5}{8}$ -inch ditto, 36 1-inch ditto unfinished, 94  $\frac{5}{8}$ -inch ditto, 18 sheets strawboard, 15 glasses, 15 brass spindles, 320 rubber nipples, 25 platforms 10 feet leather hose, 900 washers and thimbles, 1 4-inch fish pot, 6 3-inch ditto, 1 2-inch ditto (old).

*For Service Pipe.* 14 1-inch union cocks, 10  $\frac{3}{4}$ -inch ditto, 238  $\frac{5}{8}$ -inch ditto, 84  $\frac{5}{8}$ -inch unfinished ditto, 106  $\frac{1}{2}$ -inch unfinished ditto, 24  $\frac{5}{8}$ -inch straight cocks, 36 1-inch T cocks, 15  $\frac{3}{4}$ -inch ditto, 27  $\frac{5}{8}$ -inch ditto, 8  $\frac{5}{8}$ -inch Y cocks, 11  $\frac{5}{8}$ -inch flange cocks, 8 1-inch air cocks, 40  $1\frac{1}{4}$ -inch nipples, 11 2-inch male couplings, 22  $1\frac{1}{4}$ -inch ditto, 26 1-inch ditto, 42  $\frac{3}{4}$ -inch ditto, 36  $\frac{5}{8}$ -inch ditto, 22  $\frac{1}{2}$ -inch ditto, 12 2-inch female couplings, 4  $1\frac{1}{4}$ -inch ditto, 152 1-inch ditto, 34  $\frac{3}{4}$ -inch ditto, 220  $\frac{5}{8}$ -inch ditto, 216  $\frac{1}{2}$ -inch ditto, 12  $\frac{5}{8}$ -inch double-headers with flanges and pipes, 4 6-inch flanges, 7 4-inch ditto, 5 2-inch ditto, 65  $\frac{5}{8}$ -inch ditto, 200 lbs. composition castings for straight cocks, 61 lbs. composition castings for  $\frac{3}{4}$ -inch couplings, 200  $\frac{5}{8}$ -inch long boxes (iron), 554 tubes, 16 T boxes, 28 Y boxes, 7 1-inch flanges, 7 1-inch tubes, 60 extension tubes.

*Lead Pipe.* 625 lbs. 2-inch pipe, 711 lbs.  $1\frac{1}{4}$ -inch ditto, 2129 lbs. 1-inch ditto, 1115 lbs.  $\frac{3}{4}$ -inch ditto, 3278 lbs.  $\frac{5}{8}$ -inch ditto, 1211 lbs.  $\frac{1}{2}$ -inch ditto, 870 lbs.  $1\frac{1}{4}$ -inch, old pipe 69 lbs.  $\frac{5}{8}$ -inch tin lined lead pipe, 86 lbs.  $\frac{5}{8}$ -inch block-tin pipe, 725 lbs. sheet lead, 30 lbs. solder, 9 lbs. block-tin.

*Blacksmith Shop.* 575 lbs. square iron, 668 lbs. flat ditto, 650 lbs. round ditto, 170 lbs. cast steel, 1500 lbs. working pieces, 5000 lbs. Cumberland coal.

*Carpenter's Shop.* 2000 feet spruce boards, 15,000 feet spruce plank, 250 feet oak plank, 17 hydrant boxes, 7 stopcock ditto, 34 top pieces, 130 hydrant boxes unfinished, 94 stopcock boxes unfinished, 18 meter boxes unfinished, 500 lbs. spikes and nails.

*Wharf Hydrants.* 5 complete, 6 cocks.

*Stable.* 3 horses, 3 wagons, 2 buggies, 1 pung, 5 sets harness, 2 sleighs, 1 ton English hay, 300 lbs. salt hay, 30 bushels grain.

*Tools.* 1 steam engine, 1 large hoisting crane, 1 boom derrick, 4 geared hand ditto, 2 sets of shears, and all the rigging for the same, tools for laying and repairing main and service pipes, 2 engine lathes, 1 fox ditto, 1 hand ditto, 1 upright drilling machine, 3 grindstones, and the necessary tools for carrying on the machine, blacksmith, carpenter's and plumber's shops, 1 circular saw, 2 large tool houses, 1 40-inch proving press, 1 36-inch ditto, 1 small ditto, also office furniture, and a large lot of patterns stored at pipe yard and at the foundries where we obtain castings.

*Beacon Hill Reservoir.* 5 swivel pipe patterns, 1 swing stage, capstan frame and levers, 1 10-inch composition cylinder, 1 6-inch ditto, 1 4-inch ditto, 6 composition jets, 8 cast-iron plates, 3 composition reel jets, 1 drinking fountain.

*Miscellaneous.* 30 gallons linseed oil, 25 gallons tallow oil, 90 lbs. white lead, 28,000 lbs. hard coal, 48 lbs. leather, 1 freight of gravel, 50 bricks, 858 lbs. gasket, 5 kegs bolts, 375 feet of damaged hose, 300 feet new hose, 1 cord wood, 12 reservoir gate covers, 5 manholes, 6 plates, lot of old iron, lot of old lumber, lot of old machinery from Marlboro.

Respectfully submitted.

E. R. JONES,

*Supt. Eastern Division.*

*Schedule of Property on the Western Division — May 15, 1867.*

1 extension table, 6 chairs, 1 cooking range, 1 marble top wash stand, 1 horse, 1 carriage, 2 sets single harness, 1 express wagon, 1 cart, 1 cart harness, 1 buffalo robe, 1 pung, 6 wheelbarrows, 2 spades, 22 shovels, 14 picks, 3 bars, 6 pean hammers, 5 small steel drills, 3 trowels, 2 double blocks, 1 single do., 1 drain mould, 1 freight truck, 1 stone do., 4 wrenches, 2 stop-plank hooks, 1 iron grapnel, 1 grindstone, 1 sand screen, 1 sand sieve, 1 scythe and snath, 2 hoes, 1 boat and awning, 4 rammers, 2 hammers, 3 water pails, 1 rain gauge, 1 pair steel-yards, 1 pair hedge shears, 2 pairs ice tongs, 1 small stone roller, 1 manure fork, 1 map of Boston and its environs, 1 hand saw, 1 iron square, 4 white-wash brushes, 1 axe, 7 barrels Portland cement.

Rejected as worthless, — 23 shovels, 6 axes, 2 hay rakes, 2 hoes, 3 iron rakes, 2 pairs rubber boots.

A. STANWOOD,

*Supt. W. D. B. W. W.*

## WATER REGISTRAR'S REPORT.

WATER REGISTRAR'S OFFICE,  
BOSTON, May 1, 1867.

JOHN H. THORNDIKE, Esq., *President Cochituate Water Board* :

SIR,—I herewith submit the following Report as required by the ordinance providing for the care and management of the Boston Water Works, passed Oct. 31, 1850.

The total number of water takers now entered for the year 1867, is 27,754, being an increase since January 1, 1866 of 265.

During the year 1866 there have been 643 cases where the water has been turned off for non-payment of water-rates. Of this number 519 have been turned on, leaving a balance of 124 still remaining off.

The total amount of water-rates received from December 31, 1865, to January 1, 1867, is . . . \$486,538 25

Of the above there was received for

water used in previous years the

sum of . . . \$27,165 06

Leaving the receipts for water fur-

nished during the year 1866 the

sum of . . . 459,373 19

In addition to the above there has

been received, for turning on water

in cases where it had been turned

off for non-payment of rates, the

sum of . . . 1,038 00

Total . . . \$487,576 25

*Amount carried forward*, . . . \$487,576 25

<i>Amount brought forward,</i>	\$487,576 25
The amount received for water rates from Jan. 1, 1867, to May 1, 1867, is	405,879 74
Of this amount there was received for water used in previous years the sum of	43,205 62
Leaving the receipts for water (as- sessed for the year 1867,) to May 1, 1867, the sum of	\$362,674 12
The total amount received from January 1, 1867, to May 1, 1867, for turning on water in cases where it had been turned off, for non-payment of rates is	658 00
	<u>\$894,113 99</u>

Total receipts from January 1, 1866, to May  
1, 1867 . . . . . \$894,113 99

The increased amount of income in 1866 over  
the previous year, is . . . . . 36,196 77

The total amount of assessments now made  
for the present year, is . . . . . 382,508 35

The estimated amount of income from the sales  
of water during the year 1867, is . . . . . 500,000 00

The expenditures of my office for the year end-  
ing May 1, 1867 have been. . . . . 14,285 46

The items of this expenditure are as follows:

Paid Wm. F. Davis, Registrar . . . .	2,200 00
Chas. H. Little, Treasurer's clerk . .	1,600 00
Charles L. Bancroft, clerk . . . .	1,163 32
<i>Amount carried forward,</i>	<u>\$4,963 32</u>



<i>Amount brought forward,</i>	.	.	.	.	\$4,963 32
Paid Stephen Badlam,	"	.	.	.	1,163 32
Edwin Jennings,	"	.	.	.	1,163 32
Jacob F. Mayo, on meters	.	.	.	.	966 96
Chas. C. Badlam, Inspector	.	.	.	.	480 36
R. D. Child,	"	.	.	.	775 00
C. M. Thompson,	"	.	.	.	775 00
F. W. Fay,	"	.	.	.	775 00
T. L. Kelley,	"	.	.	.	775 00
J. Hayward,	"	.	.	.	775 00
O. A. Ramsdell,	"	.	.	.	775 00
F. C. Hogan,	"	.	.	.	50 00
H. T. Beal,	"	.	.	.	47 50
J. L. Fairbanks, stationery	.	.	.	.	406 10
J. E. Farwell & Co., printing	.	.	.	.	7 30
A. Mudge & Son,	"	.	.	.	387 28
					<hr/>
					\$14,285 46
					<hr/>

## METERS.

The total number of meters now applied to the premises of water-takers is 879. Of this number 681 are  $\frac{5}{8}$ -inch, 176 1-inch, 18 2-inch, 3 3-inch, and 1 4-inch size.

They are attached to a variety of establishments, embracing hotels, railroads, manufactories, stables, confectionery, oyster saloons, and buildings occupied by several tenants.

The following table exhibits the yearly revenue received from the sale of Cochituate water, since its introduction into the city, October 25, 1848:

Received by Water Commissioners, as per Audi-

tor's Report, in 1848 . . . . .				\$972 81
From January 1, 1849, to January 1, 1850, .				71,657 79
"	"	1850,	" 1851,	99,025 45
"	"	1851,	" 1852,	161,052 85
"	"	1852,	" 1853,	179,567 39
"	"	1853,	" 1854,	196,352 32
"	"	1854,	" 1855,	217,007 51
"	"	1855,	" 1856,	266,302 77
"	"	1856,	" 1857,	282,651 84
"	"	1857,	" 1858,	289,328 83
"	"	1858,	" 1859,	302,409 73
"	"	1859,	" 1860,	314,808 97
"	"	1860,	" 1861,	334,544 86
"	"	1861,	" 1862,	365,323 96
"	"	1862,	" 1863,	373,922 33
"	"	1863,	" 1864,	394,506 25
"	"	1864,	" 1865,	430,710 76
"	"	1865,	" 1866,	450,341 48
"	"	1866,	" 1867,	486,538 25
"	"	1867, to May 1, 1867, .		405,879 74
				<hr/>
				\$5,622,905 89

Statement showing the number of houses, stores, steam engines, etc., in the City of Boston, supplied with Cochituate water to the first of January 1867, with the amount of water rates paid for 1866:

19,642	Dwelling-houses . . . . .	\$244,428	90
6	Boarding " . . . . .	198	00
69	Model " . . . . .	1,921	62
3	Lodging . . . . .	55	00
5	Hotels . . . . .	412	00
4,457	Stores and shops . . . . .	39,867	03
138	Buildings . . . . .	4,530	71
412	Offices . . . . .	3,239	55
36	Printing offices . . . . .	524	12
20	Banks . . . . .	257	50
27	Halls . . . . .	311	50
1	Theatre . . . . .	25	00
25	Private schools . . . . .	235	50
12	Asylums . . . . .	595	00
5	Green-houses . . . . .	47	00
64	Churches . . . . .	688	25
4	Markets . . . . .	752	00
119	Cellars . . . . .	759	50
335	Restaurants and saloons . . . . .	4,142	12
5	Club-houses . . . . .	99	00
1	Bath-house . . . . .	55	00
45	Photographers . . . . .	1,248	58
12	Packing-houses . . . . .	315	75
1,020	Stables . . . . .	7,512	40
18	Factories . . . . .	529	09
2	Breweries . . . . .	39	00
<i>Amount carried forward,</i> . . . . .		\$312,789	12

<i>Amount brought forward,</i>	.	.	.	.	\$312,789 12
6 Bleacheries	.	.	.	.	80 00
1 Laundry	.	.	.	.	25 00
67 Bakeries	.	.	.	.	557 00
5 Ship-yards	.	.	.	.	65 00
3 Dry docks and engines	.	.	.	.	84 00
44 Shops	"	"	.	.	2,515 63
32 Stores	"	"	.	.	1,625 25
4 Foundries	"	"	.	.	146 30
7 Factories	"	"	.	.	348 82
3 Printing	"	"	.	.	181 76
1 Bakery	"	"	.	.	33 00
1 Ship-yard	"	"	.	.	28 00
2 Binderies	"	"	.	.	37 50
2 Buildings	"	"	.	.	100 00
1 Pottery and engine	.	.	.	.	35 00
1 Laundry	"	"	.	.	36 00
1 Mill	"	"	.	.	132 96
43 Stationary	"	.	.	.	1,738 49
4 Armories	.	.	.	.	39 75
2 Gymnasiums	.	.	.	.	41 50
527 Hand-hose	.	.	.	.	2,990 00
12 Fountains	.	.	.	.	89 00
Gas Light Co. (filling tank)	.	.	.	.	27 18
Mill-dam Co.	.	.	.	.	266 75
Custom House	.	.	.	.	150 00
50 Steam-boats	.	.	.	.	9,650 14
Office (Harbor Master)	.	.	.	.	6 00
" (City Scales)	.	.	.	.	9 00
Old State House	.	.	.	.	27 00
Court House	.	.	.	.	262 50
Probate Building	.	.	.	.	47 50
<i>Amount carried forward,</i>	.	.	.	.	\$334,165 15

<i>Amount brought forward,</i>	.	.	.	.	\$334,165 15
House of reception	.	.	.	.	10 00
5 Fire-alarm motors	.	.	.	.	50 00
22 Fire-engines, hose and hook and ladder houses	.	.	.	.	553 50
277 Public Schools	.	.	.	.	1,882 00
2 City stables	.	.	.	.	200 75
Offal station	.	.	.	.	150 00
Steamer Henry Morrison	.	.	.	.	192 56
House of Correction	.	.	.	.	462 00
Public Library	.	.	.	.	50 00
Faneuil Hall	.	.	.	.	40 00
Shop (paving department)	.	.	.	.	9 00
Common sewer department (making mortar)	.	.	.	.	50 00
Public urinals	.	.	.	.	145 00
Street sprinkling	.	.	.	.	400 00
Deer park	.	.	.	.	10 00
Boston Common	.	.	.	.	50 00
J. F. Paul (contract pipe)	.	.	.	.	16 70
Building purposes	.	.	.	.	1,674 63
Contractors for supplying shipping	.	.	.	.	2,017 16
Metered water	.	.	.	.	117,244 74
					<hr/>
					\$459,373 19
					<hr/>

*Statement showing the number and kind of Water Fixtures contained within the premises of Water-takers in the City of Boston, to January 1, 1867, as compared with previous years.*

1864.	1865.	1866.	REMARKS.
4,831	4,797	4,774	Taps. These have no connection with any drain or sewer.
38,844	40,184	40,496	Sinks.
15,488	16,767	17,204	Wash-hand basins.
5,262	5,475	5,499	Bathing tubs.
6,286	6,752	7,398	Pan water-closets.
7,117	7,317	7,563	Hopper water-closets.
....	181	312	" " " pull.
935	315	239	" " " self-acting.
....	213	226	" " " waste.
....	498	536	" " " door.
1,644	1,741	1,790	Urinals.
5,535	6,087	6,365	Wash-tubs. These are permanently attached to the building.
12	737	756	Shower-baths.
12	13	13	Hydraulic rams.
708	715	773	Private hydrants.
278	334	350	Slop-hoppers.
....	28	33	Foot-baths.
86,952	92,154	93,327	

Respectfully submitted.

WM. F. DAVIS,  
Water Registrar.

## REPORT OF THE CITY ENGINEER.

---

OFFICE OF CITY ENGINEER,  
BOSTON, May 5, 1867.

JOHN H. THORNDIKE, Esq., *President Cochituate Water Board*:

SIR,— In compliance with the ninth section of the ordinance relating to the department of engineering and surveying, the following report is respectfully submitted:

## EASTERN DIVISION.

The details of the condition of the works in this division will be found in the Report of the Superintendent.

A table of the average monthly heights of the water in the Brookline and City Reservoirs above tide marsh level for the past five years will be found on page 60. It will be noticed that the loss of head from Brookline to Beacon Hill and to South Boston varies but little from last year, although the average level was a trifle lower.

The water was shut off from the East Boston Reservoir last fall for examinations, with a view to discover in what manner to remedy its leaky condition. Certain experiments were made by the Superintendent, which, I am informed, tend to show that there is no leakage below a line ten feet above the bottom. I think it would be well, before making any expensive alterations, to make sure, if possible, of the exact cause of the defects, and with this view I propose still further observations of the amount of leakage and the localities where the leakage is apparent.



## LAKE COCHITUATE.

With the exception of the Course Brook culvert, the filter dam at Pegan Brook, certain portions of the slope-walls, and the fences in the vicinity of the Superintendent's house, the structures, etc., at the Lake are in good condition. The high stage of the water in the Lake during the year has prevented the re-building of the Course Brook culvert as recommended in last year's report. When it is rebuilt, the slopes of the road on either side should be protected with a substantial wall, and paved gutters made to carry off the surface water which in heavy rains does so much damage to the road. During the severe thunder storm in the month of July, when, in the space of a few hours, over seven inches of rain fell in the vicinity of the Lake, a small portion of the southerly end of the filter dam was washed away. The water behind the dam rose so rapidly that the flume, being partially choked with drift-wood, weeds, grass, etc., was inadequate to carry off the flood, and it soon overtopped the dam and worked its way through the light sandy soil on the southerly end of the dam, and carried away about fifteen feet in width of the bank and a small portion of the stone work. No repairs have been made, owing to the high state of the water, and consequently the dam has been inoperative since then.

Had this dam been located by the late Superintendent where I advised, and built into the bank in the manner proposed, this accident, I think, would not have occurred. The object of the Superintendent in changing the location was to save about twenty feet in the length of the dam, the expense of which would have been trifling.

The slope-wall in various places at the Lake, especially where laid on slopes too steep, has been undermined, and with portions of the bank slid into the Lake. These portions cannot be repaired until the water is considerably lower, and when the

time comes the slopes should be reduced, and if possible larger stone used. I would suggest that, instead of using small field stone which have to be hauled a considerable distance, we should get out from some of the ledges and large bowlders on our own premises stone more suitable for such work.

The fences along the road, in the vicinity of the City's house, are in bad condition; the posts are nearly all rotten, and have had to be braced to hold them up. The repairs that have been made this spring will probably make the fences answer for this year, but in another year they should be re-built.

January 1, 1866, water at the lake was 8 feet, 11 inches above the bottom of the conduit; on the 12th of February it had fallen to 7 feet 3 inches, the lowest point reached during the year; it then began to rise, and continued, with slight fluctuations, until April 30, when it was 12 feet, 3 inches. On May 27 it had fallen to 11 feet 11 inches, and by the 18th of June had risen again to 12 feet 10 inches. On the 28th of July it stood at 12 feet, and continued to fall, with slight fluctuations, until the 15th of November, to 11 feet, 3½ inches, when it began to gain, and on the 31st of December was 12 feet and 2 inches.

By reference to the table on page 56, it will be seen that the average height of the water in the Lake for the year 1866, was 11  $\frac{2}{10}$  feet above the bottom of the conduit, being a higher average than for any year since the Lake was raised in 1859, except in 1863, when the average was 13  $\frac{5}{10}$  feet.

On page 55 will be found a statement of the rain-fall on the water-shed of the Lake, the amount of water consumed and wasted, the percentage of rain-fall received into the Lake each year for a term of thirteen years, and the average per year for the whole term. It will be seen that only 25 per cent of the rain-fall of 1866 was received into the Lake, being the smallest percentage for thirteen years, and the average percentage for the whole term was forty-seven.

## CONSUMPTION OF WATER.

The tables on pages 52 and 53 show the daily average number of gallons of water consumed for each month and year from 1849 to 1866, inclusive. The record for 1866 shows an average daily consumption of 12,229,000 gallons, being a decrease of 433,000 gallons from the average daily consumption of 1865. Although a comparison of the amount used daily for the past year with that of 1861 shows the enormous decrease of 33 per cent; yet if we take into account the increase of population, in the mean time, the result is still more gratifying. For instance in 1861 the population was in round numbers 180,700; the consumption for that year was 18,189,304 gallons per day, or  $100\frac{2}{3}$  gallons per day for each inhabitant; in 1866 the population is estimated at 200,000, the consumption per day, 12,229,000 gallons, and the daily amount per head  $61\frac{14}{100}$  gallons. So that the actual decrease since 1861 is 39 per cent, instead of 33 per cent, as above stated.

In my report last year I contended, and I think proved, that all the present legitimate wants of the city could be abundantly served with a supply of 8,000,000 gallons per day. I see no reason to change that statement. The population of Boston is estimated at 200,000, and for all domestic uses, the records of the meters in the houses of the members of your Board show that 25 gallons per inhabitant is an ample supply. At this rate, the domestic uses of water would require a daily supply of 5,000,000 gallons. The amount consumed by large manufacturing, hotels, etc., as measured by meters during the last year, was about 2,000,000 gallons per day, and if we estimate the miscellaneous consumption at 1,000,000 gallons per day, we have a total of 8,000,000 gallons, which is unquestionably a liberal supply. If an increase in the number of meters, a more rigid inspection of the premises of water-takers with a view to detect cases of waste, and a special tax on hopper closets, will

reduce our consumption to 8,000,000 gallons per day, let it be done.

#### CONDUIT.

Since the date of the last report, those portions of the conduit considered in the worst condition have been examined several times. The section at Ware's Valley, in Needham, near the West Pipe Chamber, which has been alluded to in former reports as in a most dangerous condition, was repaired last summer with Portland cement, and a recent examination showed it to be in very fair condition. At the same examination the whole line, from Charles river to the Brookline tunnel, was carefully inspected. On the Second Division, between Stations 196 and 197, is a small crack in the top arch, about fifty feet in length; from Station  $217\frac{1}{2}$  to  $218\frac{1}{2}$ , is a crack in the bottom and top arches, which needs attention; from 224 to 225, is a double crack in the top arch; and from  $232\frac{1}{2}$  to 234, a very slight one in the top. The worst place in this division is a portion about sixty-five feet in length, between Stations  $242\frac{3}{4}$  and  $244\frac{1}{2}$ ; the crack at this place is quite a serious one, and should be repaired at once. A small crack was discovered between Stations 254 and 255; and this section is very dirty and needs a thorough cleaning. Only one more crack was found in this division, and that was a very slight one, between Stations  $263\frac{1}{2}$  to 264.

The condition of the conduit below Newton Centre, on the Third Division, was in better general condition, as to cleanliness and freedom from cracks, than the portion between Charles river and Newton Centre. A slight crack about thirty feet long was found in the top arch, between Stations 1 and 2; at Station  $37\frac{1}{2}$  was found a large fissure in the bottom arch, through which a large volume of water, and some sand, was flowing into the aqueduct—this is the same fissure alluded to in my last report, and was then reported as plugged up; east of Station 51 is a slight crack and a small fissure in the bottom, bringing in water;

the old cracks, between Stations 119½ and 124, and between 133½ and 138½, do not show much change—those portions that were pointed with Portland cement remain very perfect; from 138½ to the western end of the Brookline tunnel, the conduit is in excellent condition.

At the time of the examination above referred to, a trial was made of the magnesium light for illuminating the interior of the conduit, and, with the exception of certain mechanical defects in the apparatus, it was a decided success, and a vast improvement over the ordinary lights hitherto used.

#### CHESTNUT HILL RESERVOIR.

This work has progressed since the date of the last report quite as satisfactorily as was expected. The first work with teams was begun on the 25th of April of last year, the number at that time being only eight, and the whole number of men employed about 200. Operations with the teams were commenced on the southerly side of the Lawrence meadow in removing the soil preparatory to building the embankment. The number of teams was increased before the close of May last to 20—that is, 40 horses and carts—by the middle of August to 30, and the number now employed is 50.

The following statement shows the average daily number of men employed in this work in each month, commencing with April 1866:

1866	{ April . . . 182	1866	{ November . . 319
	{ May . . . 327		{ December . . 270
	{ June . . . 385	1867	{ January . . 257
	{ July . . . 400		{ February . . 240
	{ August . . . 424		{ March . . . 222
	{ September . . 396		{ April . . . 373
	{ October . . . 386		{ May . . . 406

Besides the horses and carts, which, with the drivers, are furnished by contract, the city has now in use fourteen yoke of cattle of its own, employed in hauling stone, removing stumps and

such kinds of work as they are better adapted for than horses. The bank on the Lawrence meadow was begun May 15th, 1866, and since that time there has been 5,463 feet in length built in that section, or all but about 600 feet, and in the lower section about 1,200 feet, making 6,663 feet in all. Of this there has been 3,622 feet covered with a substantial protection wall of stone, 1,649 of which was laid by the day and 1,973 by contract. The whole number of square yards of slope-wall now laid is 7,074. The work on the wall was begun May 24th, 1866, and stopped on the 6th of November. On the 22d of April, 1867, it was resumed, and is now rapidly progressing.

About one-half (2,100 feet) of the new location of Beacon Street has been graded and made ready for travel, and it is expected that the remainder will be completed and opened to public travel in a few weeks.

Considerable progress has been made in preparing the foundations for the main embankment or dam on the easterly end of the Reservoir across the mouth of the basin. A trench has been opened in the natural soil under the centre of the bank, about 1,500 feet in length, and of an average width and depth of ten feet; for a distance of 750 feet the bottom of this trench is solid rock, and the indications are that we shall find the same bottom entirely across the meadow. As this embankment is to be the dam to retain the water, the utmost care will be taken in its construction, both as to the material used and the manner of compacting it, in order that it shall be a water-tight structure.

The work during the winter months, from the middle of November to the middle of April was confined chiefly to the removal of the muck from the Lawrence Meadow, work on the ledges, and the construction of a retaining wall on the southerly side of the driveway on the north side of the lower section of the Reservoir. This is a very substantial structure, varying in height from seven to twenty feet, and is about 410 feet in length. This wall is not yet completed, and work thereon has been

suspended, the workmen being now employed in laying the slope-wall. As this work can be done in the winter, when the work on the slope-walls must cease, it is not proposed to complete it until another winter.

In June last it was found necessary to procure an engine and pump to keep the trench free of water near the proposed location of the effluent gate-house while removing the sand. The pump commenced working on the 5th of July, and was kept in operation most of the time until August 27th, when an accident occurred which brought its operations to an abrupt termination. The engineer who had charge of the engine and pump had gone to dinner, and had not been absent more than fifteen minutes, when the boiler exploded, tearing the crown-plate, directly over the fire almost off, and sending the engine and boiler some fifty feet into the air, and about one hundred and fifty feet horizontally. Fortunately no one was injured, although one of the foremen on the work and a laborer had just left the side of the boiler, not liking a peculiar hissing sound, and were not more than fifty feet from it when the explosion occurred.

Upon the return of the engineer, he was closely questioned as to the condition of the boiler when he left, the state of the water, and the condition of the fire. His statements at this time and at a subsequent investigation were such that, if true, an explosion would have been impossible. He insisted that the height of the water in the boiler was tested immediately before leaving for dinner, and was found to be so high that it would discharge mixed with steam from the upper cock, and run freely from the lower one; that the pressure-gauge indicated only thirty lbs. per square inch<sup>1</sup> and that the fire was low; and furthermore that, as an additional precaution he left the door of the fire-box open. The boiler was examined by Messrs. McLauthlin and Dutemple, experienced mechanics of this city, and by the Superintendent, Resident Engineer, and myself, and we

all agreed that the explosion was caused by the low state of the water in the boiler, and that the accident was due entirely to the carelessness of the engineer, who was promptly discharged. A new engine was procured with all possible despatch, but it was thought advisable to locate it at a pit in the Lawrence meadow, which had been sunk about nine feet below the level of the meadow, and into which the water in the soil of the meadow was led by a system of open ditches. By this means the soil and muck of the meadow became drained and in a fit condition to be removed during the winter. This pump was found to be inadequate, and a larger one substituted which is now in operation at the same place. It is intended to remove a portion of the present aqueduct at and near the site of the proposed intermediate gate-house, for the purpose of building said gate-house and making the embankment, which, at this place divides the reservoir into two sections, water-tight; when this is done, a twenty-inch pipe will be laid at such a level as to drain the Lawrence meadow without the aid of the pump, and the engine and pump will be replaced at the point where the explosion occurred.

On the 10th of February occurred the greatest freshet known in this vicinity for years, and it furnished an excellent opportunity to determine the maximum run of surface water through the meadows, and which must be provided for with artificial canals or brick drains when the reservoir is completed. It was found that the four feet stone culvert built by Mr. Knowlton, in the fall of 1865, was inadequate in size, the water backing up four feet from the top on the upper side. This culvert will be replaced by a brick drain 233 feet in length, and 6 feet 4 inches high, by 6 feet wide in the clear. This will connect with another 5 feet high by 4 feet 8 inches wide, and 532 feet in length; then it is reduced again to 4 feet 4 inches high by 4 feet wide, of which dimensions there will be 1,926 lineal feet. This reduction in size continues at intervals as follows: 1,697 feet of 3 feet 8 inches by 3 feet 4 inches; 1,561 feet of 3 feet 4



inches by 3 feet, and 1,790 feet of circular drain of an internal diameter of 2 feet and 6 inches; making a total length of all sizes of 7,739 feet. Work on this drain will be commenced at once and finished this season.

The work is now progressing well, and by the date of another annual report will be far advanced towards completion.

The expenses of my department in connection with this work during the year ending April 30, have been as follows, viz:

Salary of Henry M. Wightman, Resident Engineer	\$1,895 52
“ “ S. C. Horn, Assistant Engineer . . .	810 50
“ “ W. F. Learned, rodman . . .	328 50
“ “ D. C. Sanger . . .	51 00
“ “ Jeremiah Sullivan, axeman . . .	506 31
Incidental expenses . . .	70 51
	<hr/>
	\$3,662 34

The above amount was paid from the appropriation for Chestnut Hill Reservoir.

**CONSUMPTION OF WATER.**  
*Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.*

MONTH.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.
January .....	1,700,000	5,181,700	7,233,700	8,280,900	8,050,500	10,695,200	9,702,700	12,669,000	15,089,000
February .....	.....	5,214,000	7,221,100	8,790,300	8,643,600	10,654,200	10,349,800	12,791,000	14,175,000
March .....	1,550,009	4,841,200	6,137,900	8,521,100	8,202,200	9,582,100	10,125,600	12,504,000	13,941,000
April .....	.....	4,961,000	5,365,200	8,048,700	7,903,600	8,738,500	8,540,000	10,800,000	12,454,000
May .....	3,600,000	5,346,100	6,238,400	8,350,000	8,123,400	9,685,300	9,103,800	10,378,000	12,414,000
June .....	4,300,000	6,906,500	7,925,000	8,033,100	8,945,900	11,745,200	9,984,400	11,223,000	12,504,000
July .....	4,800,000	8,514,200	7,180,200	9,608,000	8,809,200	10,613,800	11,056,600	13,167,000	13,551,000
August .....	4,100,000	8,004,600	7,235,000	9,709,300	8,461,900	10,028,100	11,120,800	12,664,000	13,077,000
September .....	4,800,000	6,535,500	7,230,600	7,920,000	8,640,700	9,712,400	11,710,800	11,522,000	12,030,000
October .....	4,550,000	4,504,300	6,716,600	6,930,000	8,871,100	8,769,800	10,771,200	11,891,000	10,864,000
November .....	3,800,000	4,960,500	6,475,500	6,637,900	8,624,700	8,030,200	10,383,200	11,691,000	11,372,000
December .....	3,600,000	5,037,000	7,663,400	7,195,800	9,223,400	10,597,600	11,307,200	13,284,000	11,241,000
Aver. for Year.	3,680,000	5,837,900	6,883,300	8,125,800	8,542,300	9,902,000	10,346,300	12,048,600	12,726,000

CONSUMPTION OF WATER.—Daily Average Number of Wine Gallons drawn from the Brookline Reservoir.

MONTHS.	1858.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.
January ....	12,160,000	14,512,000	17,862,000	21,106,769	17,000,000	16,112,000	18,954,000	13,412,000	14,850,000
February ...	14,399,000	14,769,000	18,901,000	20,804,131	17,000,000	17,328,000	18,846,000	13,318,000	13,385,000
March .....	14,154,000	14,480,000	15,409,000	19,453,344	17,300,000	16,681,000	16,841,000	12,027,000	12,284,000
April .....	13,465,000	13,760,000	14,621,000	17,151,593	15,300,000	15,125,000	16,506,000	11,975,000	11,251,000
May .....	11,423,000	11,302,000	14,790,000	16,687,882	14,800,000	15,407,000	16,094,000	13,660,000	11,076,000
June .....	10,867,000	11,639,000	17,838,000	17,231,984	16,600,000	16,138,000	17,730,000	14,391,000	11,878,000
July .....	13,621,000	13,219,000	17,239,000	18,897,809	16,400,000	15,954,000	18,112,000	13,207,000	12,668,000
August .....	13,141,000	12,704,000	19,297,000	18,272,365	17,000,000	16,980,000	16,188,000	13,426,000	12,441,000
September ..	12,745,000	12,389,000	17,957,000	18,098,259	17,000,000	17,035,000	16,798,000	12,624,000	11,842,000
October ....	12,969,000	12,026,000	16,938,000	17,987,128	17,300,000	15,779,000	15,479,000	11,273,000	12,396,000
November ..	12,143,000	12,715,000	16,862,000	16,604,076	17,100,000	16,028,000	14,079,000	11,750,000	11,262,000
December....	13,075,000	14,586,000	19,151,000	15,976,362	17,000,000	16,295,000	14,547,000	10,877,000	11,412,000
Ave for y'r.	12,847,000	13,175,000	17,238,000	18,189,304	16,600,000	16,238,500	16,631,000	12,662,000	12,229,000

*Conduit.*

The following table shows the different heights at which the water has been running, and the number of days in each month at the different heights.

The height of the conduit is six feet four inches.

1866.	HEIGHTS IN FEET AND INCHES.															
	0.0	4.5	4.6	4.7	4.8	4.9	4.10	4.11	5.0	5.1	5.2	5.4	5.6	6.0	6.2	6.4
	NUMBER OF DAYS IN EACH MONTH.															
January . . . . .	.	.	.	.	.	.	.	.	6	.	.	.	6	19	.	.
February . . . . .	.	.	.	.	.	.	.	.	18	.	.	.	7	3	.	.
March . . . . .	.	.	.	.	.	.	12	.	12	1	4	1	1	.	.	.
April . . . . .	.	.	.	.	.	.	30	.	.	.	.	.	.	.	.	.
May . . . . .	.	9	1	.	.	10	10	.	1	.	.	.	.	.	.	.
June . . . . .	.	21	.	.	.	2	1	.	.	.	.	.	.	4	1	1
July . . . . .	1	6	.	.	.	1	4	.	12	.	1	.	3	3	.	.
August . . . . .	1	3	.	.	.	13	.	.	2	.	.	2	1	7	2	.
September . . . . .	1	.	.	.	5	5	16	1	.	.	.	.	.	2	.	.
October . . . . .	2	.	.	.	15	2	4	.	3	.	.	1	1	3	.	.
November . . . . .	.	1	5	.	6	7	8	.	2	.	1	.	.	.	.	.
December . . . . .	.	.	.	3	6	12	5	1	3	.	1	.	.	.	.	.
Total . . . . .	5	40	6	3	32	52	90	2	59	1	7	4	19	41	3	1

## REPORT OF THE WATER BOARD.

55

*Statement showing Amount of Rain-Fall on Water-shed of Lake Cochituate, Amount of Water consumed and wasted, available Amount received into Lake, available percentage of Rain-Fall, etc., from 1852 to 1866, inclusive.*

YEAR.	Rain-Fall.	Amount of Rain-Fall on watershed of Lake Cochituate.		Amount of Water consumed.		Amount of Water wasted from Lake.		Total am't consumed and wasted.		Rise of Lake during the year.		Fall of Lake during the year.		Total available amount of Rain-Fall received into Lake.		Available daily average am't of Rain-Fall rec'd into Lake.		Av'ble percentage of Rain-Fall rec'd into Lake.
	INCHES.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.	GALLONS.		
1852 *	47.93	15,759,207,000	2,947,042,800	4,020,566,885	6,994,609,685	261,360,000	6,733,249,685	18,396,857	43 per cent.									
1853	55.86	18,366,561,000	3,117,939,500	3,166,417,500	6,284,357,000	239,580,000	6,523,937,000	17,873,800	35 per cent.									
1854	43.15	14,187,562,000	3,614,230,000	4,187,733,020	7,801,963,020	217,800,000	7,584,163,020	20,778,529	53 per cent.									
1855	34.96	11,494,719,000	3,776,399,500	No acct. kept.	.....	326,700,000	.....	.....	.....									
1856	40.80	13,414,892,000	4,409,787,600	"	.....	.....	.....	.....	.....									
1857	63.10	20,747,052,000	4,644,990,000	10,625,900,000	15,270,890,000	32,670,000	15,303,560,000	41,957,562	74 per cent.									
1858	48.66	15,996,232,000	4,689,155,000	1,934,500,000	6,623,655,000	.....	6,482,085,000	17,759,013	40 per cent.									
1859 †	49.02	16,117,602,000	4,808,875,000	7,569,000,000	12,377,875,000	283,140,000	12,661,015,000	34,687,712	78 per cent.									
1860	55.44	18,228,471,000	6,309,108,000	None.	6,309,108,000	174,240,000	6,483,348,000	17,714,065	35 per cent.									
1861	43.44	15,269,303,000	6,639,095,900	3,377,558,966	10,016,654,866*	.....	8,557,394,866	23,444,917	56 per cent.									
1862	49.69	16,337,880,000	6,959,000,000	33,200,000	6,092,200,000	1,306,800,000	7,399,000,000	20,271,233	45 per cent.									
1863	69.30	22,785,586,000	5,927,052,500	2,165,696,470	8,092,748,970	762,300,000	8,855,048,970	24,260,408	39 per cent.									
1864	42.60	14,006,726,000	6,105,306,700	1,368,746,000	7,474,052,700	.....	5,625,475,700	15,870,152	40 per cent.									
1865	49.46	16,262,266,000	4,621,630,000	1,688,120,674	6,809,750,674	743,242,500	7,052,973,174	19,323,270	43 per cent.									
1866	62.32	20,490,455,000	4,463,585,000	None.	4,463,585,000	743,242,500	5,206,827,500	14,265,280	25 per cent.									
Aver. 50.58		Aver. daily waste for 13 years, 8,458,900 " " for 6 yrs., '52-59, 14,378,900 " " last 7 " '60-66, 3,379,000							47 per cent aver.									

\* Observations of Rain-Fall at Lake Cochituate commenced 1852, and these observations are assumed as correct for the whole district. † Lake raised 2 feet.

*Table of the average monthly and yearly heights of water in the Lake above the bottom of the Aqueduct.*

MONTHS.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.*	1860.	1861.	1862.	1863.	1864.	1865.	1866.
January . . . . .	10.87	9.50	10.63	9.51	10.54	10.6	8.06	9.53	10.75	10.80	10.83	11.93	6.09	11.33	13.88	7.41	8.37
February . . . . .	10.68	10.21	10.20	10.78	10.95	10.65	7.59	10.28	10.05	12.17	11.36	12.77	6.57	12.85	13.71	8.24	8.73
March . . . . .	11.03	10.43	10.49	10.44	10.93	10.68	6.96	10.67	9.35	12.45	12.67	13.21	8.65	13.95	14.33	12.28	10.58
April . . . . .	11.46	11.17	11.23	10.68	10.66	11.57	10.24	12.30	9.36	12.06	12.72	14.14	12.40	14.59	14.32	14.00	11.96
May . . . . .	11.38	11.02	10.94	10.98	10.87	11.35	12.05	12.05	10.67	12.06	11.52	13.88	14.45	14.01	14.26	14.00	12.01
June . . . . .	11.36	10.40	10.28	10.62	10.33	10.69	11.78	12.14	11.72	11.96	10.83	12.99	14.43	13.29	13.51	13.41	12.72
July . . . . .	11.09	9.76	9.44	9.45	9.00	9.86	10.67	11.41	11.74	10.22	10.42	11.50	14.05	12.82	11.33	12.28	11.84
August . . . . .	10.92	9.01	8.40	8.64	6.67	9.01	11.59	11.70	11.30	10.24	9.42	10.27	12.97	13.73	9.65	11.18	11.79
September . . . . .	11.00	8.00	5.68	7.78	6.64	7.52	10.32	11.72	10.40	9.84	9.42	8.71	11.33	13.43	7.91	10.09	11.59
October . . . . .	9.39	7.55	6.55	7.34	5.90	6.42	10.10	11.10	8.72	10.15	10.35	7.79	10.30	12.94	6.46	9.02	11.72
November . . . . .	9.18	8.07	7.74	9.58	6.09	6.28	10.80	11.16	9.01	9.98	10.44	7.22	10.24	13.26	5.48	8.74	11.41
December . . . . .	9.57	9.67	8.49	10.57	8.38	7.29	10.97	11.02	9.85	10.54	11.17	6.88	11.70	14.06	5.41	8.48	11.68
Yearly averages . . . . .	10.66	9.57	9.17	9.70	9.00	9.29	10.14	11.26	10.24	11.04	10.93	10.94	11.10	13.52	10.84	10.76	11.20

\* High-water mark raised two feet.

*Monthly Fall of Rain in Inches, in 1866.*

MONTH.	PLACES AND OBSERVERS.							
	Lake Cochituate, by E. F. Knowlton.*	Boston, by J. P. Hall.	Boston, by W. H. Bradley, Superintendent of Sewers.	Lowell, by Merrimac Manufacturing Company.	Lowell, by Locks and Canals Company.	Cambridge, Observatory.	Waltham, by Boston Manufacturing Company, J. R. Scott, Agent.	Providence, by A. Caswell.
January . . . . .	1.44	. . . .	3.73	1.66	1.92	. . . .	1.20	2.35
February . . . . .	5.80	. . . .	5.28	4.68	4.70	. . . .	4.78	5.64
March . . . . .	3.92	. . . .	4.70	3.50	3.61	. . . .	3.50	4.29
April . . . . .	1.94	. . . .	2.03	2.56	2.85	. . . .	1.36	2.02
May . . . . .	6.46	. . . .	5.04	4.22	4.48	. . . .	5.50	5.29
June . . . . .	4.80	. . . .	3.41	2.64	2.66	. . . .	3.49	4.42
July . . . . .	13.35	. . . .	5.42	4.54	5.56	. . . .	5.70	2.03
August . . . . .	3.98	. . . .	3.87	3.52	3.68	. . . .	3.42	3.54
September . . . . .	8.36	. . . .	5.90	3.92	3.81	. . . .	6.86	5.75
October . . . . .	3.43	. . . .	2.72	1.62	1.64	. . . .	1.94	2.78
November . . . . .	4.52	. . . .	3.74	2.32	2.71	. . . .	2.60	3.97
December . . . . .	4.32	. . . .	4.86	3.00	3.74	. . . .	3.11	3.96
Totals . . . . .	62.32	. . . .	50.70	38.18	41.36	. . . .	43.46	46.04

NOTE.—Melted snow is, as usual, included in the above amounts of rain-fall.

\* Rain-gauge at the Lake kept by E. F. Knowlton until March; since then by Richard Carroll, under the direction of the Chairman of the Western Division.

*Table showing the days in 1866 upon which rain fell, and the amount in inches and hundredths, compiled from observations made by W. H. Bradley, Superintendent of Sewers.*

DAYS.	MONTHS.											
	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	INCHES.											
1. ....	..	..	..	..	..	..	..	..	..	..	..	..
2. ....		..	..	..	.64	..	..	..	..	..	..	..
3. ....	..	..	..	..	..	.69	..	.20	1.31	..	..	.44
4. ....		..	..	..	..	..	..	..	..	..	..	..
5. ....	..	..	..	..	..	..	..	..	..	..	..	..
6. ....	..	..	..	..	..	..	..	..	..	..	..	.08
7. ....	.10	..	..	..	..	.57	..	..	..	..	..	..
8. ....	..	..	..	.67	..	..	..	..	.20	..	..	.60
9. ....	..	.48	..	..	.04	..	.54	1.08	..	..	..	..
10. ....	..	..	..	..	..	..	..	..	..	..	..	..
11. ....	..	..	..	..	..	..	..	..	..	..	..	..
12. ....	..	1.72	..	..	..	..	..	..	.61	..	.27	..
13. ....	..	..	..	..	..	.22	..	..	..	..	..	..
14. ....	..	..	..	.22	..	..	..	..	.72	.26	..	..
15. ....	..	1.76	..	..	..	.06	..	.16	..	..	..	..
16. ....	1.40	..	.93	..	..	..	..	..	..	..	.88	1.39
17. ....	..	..	..	..	.36	..	.32	..	..	..	..	..
18. ....	..	..	..	..	.02	.76	.41	..	..	..	..	..
19. ....	..	.88	..	.44	..	..	..	.32	.64	..	..	..
20. ....	..	..	..	..	..	..	..	..	..	..	.10	..
21. ....	..	..	.74	..	.20	..	..	.26	.21	..	.48	..
22. ....	..	..	..	..	1.28	..	..	.17	.20	..	..	..
23. ....	..	..	..	.58	..	..	1.35	..	..	.64	.36	..
24. ....	..	.44	.98	..	..	..	.14	1.68	..	..	..	.76
25. ....	..	..	..	..	.18	..	..	..	.21	..	..	..
26. ....	..	..	..	..	..	..	..	..	..	..	..	..
27. ....	..	..	..	..	1.86	..	.20	..	1.80	.12	..	1.11
28. ....	..	..	..	..	..	.82	1.22	..	..	..	..	..
29. ....	..	..	1.88	..	.26	.29	..	..	..	..	..	..
30. ....	.02	..	..	.12	.20	..	1.24	..	..	1.70	1.65	..
31. ....	..	..	.17	..	..	..	..	..	..	..	..	.48
	3.73	5.28	4.70	2.03	5.04	3.41	5.42	3.87	5.90	2.72	3.74	4.86



*Annual Amount of Rain-Fall, in Inches, at Lake Cochituate,  
Boston and vicinity, 1849 to 1866, inclusive.*

YEAR.	PLACES AND OBSERVERS.						
	Lake Cochituate, by E. F. Knowlton.	Boston, by J. P. Hall.	Cambridge, by W. C. Bond and Geo. P. Bond.	Waltham, by E. Hobbs and J. R. Scott, Agt., Boston Manufacturing Co.	Lowell, by Merrimac Manufacturing Co.	Lowell, by Locks and Canals Co., J. B. Francis.	Providence, by A. Caswell.
1849.....	....	40.30	40.97	40.74	51.09	....	34.69
1850.....	....	53.98	54.07	62.13	45.68	....	51.48
1851.....	....	44.31	41.97	41.00	41.00	....	43.30
1852.....	* 45.93	47.94	40.51	42.24	42.78	....	38.58
1853.....	* 55.86	48.86	53.83	45.04	43.92	....	53.27
1854.....	43.15	45.71	45.17	41.29	42.08	....	46.25
1855.....	34.96	44.19	47.59	40.63	44.89	48.41	39.05
1856.....	40.80	52.16	53.79	42.33	42.49	45.97	40.97
1857.....	63.10	56.87	57.92	44.04	49.38	52.02	44.74
1858.....	48.66	52.67	45.46	37.40	37.73	35.80	44.51
1859.....	49.02	56.70	....	48.49	47.51	48.41	45.29
1860.....	55.44	51.46	46.95	....	46.91	46.67	38.24
1861.....	46.44	50.07	50.14	....	43.32	42.95	44.25
1862.....	49.69	61.06	57.21	....	44.26	44.61	50.09
1863.....	69.30	67.72	56.42	53.66	52.37	57.81	54.17
1864.....	42.60	49.30	....	36.56	38.11	40.64	36.83
1865.....	49.46	47.83	43.59	35.84	37.38	38.82	44.69
1866.....	62.32	....	....	43.46	38.18	41.36	46.04

\* By J. Vannevar.

## Average Monthly Heights of Water in Reservoirs at Brookline, Beacon Hill, South and East Boston, 1861-66, inclusive.

MONTH.	BROOKLINE.				BEACON HILL.				SOUTH BOSTON.				EAST BOSTON.			
	1862.	1863.	1864.	1865.	1866.	1862.	1863.	1864.	1865.	1866.	1862.	1863.	1864.	1865.	1866.	1866.
January . . . . .	122.46	123.64	122.37	123.31	122.28	117.48	118.36	117.72	119.18	119.20	113.66	115.73	110.63	114.21	114.38	96.26
February . . . . .	122.85	123.23	122.61	122.82	122.47	119.46	118.18	117.54	118.91	119.65	114.08	115.54	110.94	113.42	114.44	94.94
March . . . . .	123.52	123.23	123.62	123.26	123.19	119.18	118.03	116.38	120.58	120.72	114.12	113.36	111.13	113.64	113.51	95.75
April . . . . .	124.18	123.85	123.82	123.38	123.45	117.91	117.27	117.21	121.28	120.70	114.93	114.73	112.07	114.82	114.99	96.71
May . . . . .	124.00	123.52	123.62	122.65	123.04	117.59	116.33	116.53	120.31	119.53	115.74	112.71	111.64	115.44	114.90	96.99
June . . . . .	123.25	123.17	122.66	123.23	123.29	116.39	115.40	115.31	120.56	118.33	114.22	111.39	109.06	114.91	114.32	95.99
July . . . . .	123.73	122.76	122.87	123.33	122.97	116.46	116.34	115.32	121.23	119.51	114.23	109.75	108.57	114.36	113.96	96.13
August . . . . .	123.70	123.11	122.64	123.36	122.80	116.22	116.05	115.19	119.83	119.17	114.03	109.80	109.53	113.80	114.07	93.96
September . . . . .	123.64	123.36	122.03	123.29	122.81	116.29	116.12	115.91	119.03	119.39	114.04	109.64	110.21	113.69	113.41	95.57
October . . . . .	123.85	122.26	123.19	123.26	123.03	* .	115.87	118.17	118.43	119.50	114.24	109.90	112.49	112.89	112.74	91.80
November . . . . .	124.07	123.63	122.78	123.38	122.75	117.20	116.85	118.55	120.14	119.78	115.94	111.25	112.49	112.74	112.03	93.57
December . . . . .	123.46	122.53	122.29	123.24	122.64	115.23	118.30	117.35	120.50	119.37	116.35	109.90	113.89	113.78	112.62	95.77
Average . . . . .	123.56	123.19	122.87	123.21	122.89	117.21	116.92	116.77	120.00	119.59	114.63	112.14	111.05	113.97	113.78	95.29

NOTE.—The above average heights are given in feet and parts, above marsh level. Maximum high water in the Brookline Reservoir is 124.6 feet above marsh level. By deducting the heights in the City Reservoirs from the heights in the Brookline Reservoir, in each month, we find the LOSS OF HEAD in the different sections of the city at that time.

\* Beacon Hill Reservoir was shut off for repairs two days in September and twenty-nine days in October, 1862. Its average height of water is, therefore, the average for eleven months only.

† East Boston Reservoir was shut off for repairs twenty-seven days in September, the month of October, and three days in November, 1866. Its average height is for nine months only.

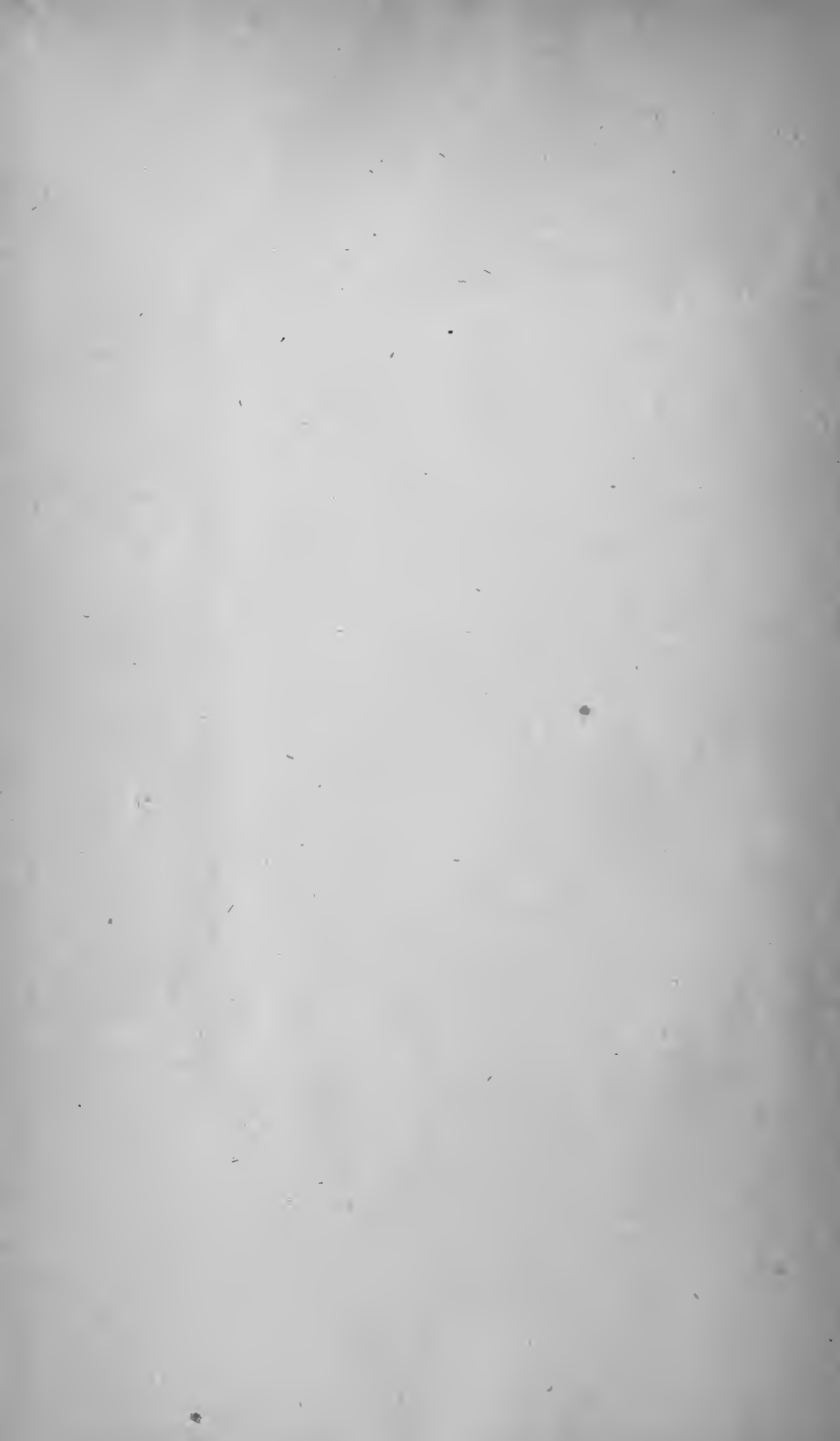
Respectfully submitted,

N. HENRY CRAFTS, City Engineer









PUBLIC LIBRARY  
OF THE  
CITY OF BOSTON.

---

**ABBREVIATED REGULATIONS.**

One volume can be taken at a time from the Lower Hall, and one from the Bates Hall.

Books can be kept out 14 days.

A fine of 2 cents for each volume will be incurred for each day a book is detained more than 14 days.

Any book detained more than a week beyond the time limited, will be sent for at the expense of the delinquent.

No book is to be lent out of the household of the borrower.

The Library hours for the delivery and return of books are from 10 o'clock, A. M., to 8 o'clock, P. M., in the Lower Hall; and from 10 o'clock, A. M., until one half hour before sunset in the Bates Hall.

Every book must, under penalty of one dollar, be returned to the Library at such time in August as shall be publicly announced.

The card must be presented whenever a book is returned. For renewing a book the card must be presented, together with the book, or with the shelf-numbers of the book.

